Joint Probability Distributions

- Just like.....
- Except....
- One variable is...
- One variable is...

Example:

		Y			
		1	2	3	Total
X	1	0.32	0.14	0.19	0.65
	2	0.17	0.06	0.12	0.35
	Total	0.49	0.2	0.31	1

		Y			
		1	2	3	Total
X	1	0.32	0.14	0.19	0.65
	2	0.17	0.06	0.12	0.35
	Total	0.49	0.2	0.31	1

Let's look at X and Y separately:

For X, what is the probability distribution?

X			
P(X)			

For Y, what is the probability distribution?

Y			
P(Y)			

Questions:

1. P(X=1) =
2. P(Y=2|X=1) =
3. P(Y=2 ? X=1) =
4. P(Y=3) =

Now what if we have the following *independent* 2 variables:

X	1	2
P(X)	0.25	0.75

Y	1	2	3
P(Y)	0.18	0.42	0.4

We want to combine the two together, in a joint probability distribution:

	1	2	3	Total
1	(0.18)(0.25) 0.045	(0.42)(0.25) 0.105	0.1	0.25
2	0.135	0.315	(0.4)(0.75) 0.3	0.75
Total	0.18	0.42	0.4	1

- Write the..

totals where they belong

- To fill out the cells of the distribution, just...

multiply row total × column total!

- Why can we just multiply the probabilities from the row and column totals to get the probability of the cell?

X & Y INDEPENDENT

So $P(X=1 \cap Y=2) = P(X=1) \cdot P(Y=2)$